

Markit iBoxx Target Duration TIPS Indices

September 2016

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Changes to the iBoxx Target Duration TIPS Indices

30 Sep 2016	<ul style="list-style-type: none"> ▪ Changes to the lockout rules. Added weight capping of 25% as another type of lockout. Lockout rules are removed if 3 or more core bonds are in lockout
01 Dec 2014	<ul style="list-style-type: none"> ▪ Markit iBoxx Target Duration TIPS index family will follow the pricing methodology described in the document 'Markit iBoxx Pricing Rules' ▪ Index restatement, complaints sections added, ▪ Additional clarifications on bond eligibility
24 Sept 2013	Change to the reference point for the lockout period
23 Mar 2012	Adjustment to the rebalancing schedule
15 Sep 2011	Launch of Markit iBoxx Target Duration TIPS Indices

1. Markit iBoxx Target Duration TIPS Index

The index measures the performance of the Treasury Inflation Protected Securities (TIPS) market with a specific target duration. Two different indices are available. The Markit iBoxx 3-Year Target Duration TIPS Index and Markit iBoxx 5-Year Target Duration TIPS Index.

1.1. Index governance

In order to ensure the independence and the objectivity of the Markit iBoxx Target Duration TIPS Index family, the index rules and their enforcement will be governed by two distinct Index Advisory Committees, in line with the governance structure for the main Markit iBoxx index families.

1.1.1. Technical Committee

The Technical Committee is composed of representatives from market makers / banks. The main purpose of this group is to provide assistance in the identification of eligible constituents, especially in the instance where the eligibility or the classification of a bond is unclear or contentious. Additionally, the Technical Committee discusses any market developments which may warrant index rule changes, and provide recommendations on changes to the rules or additional indices. It also reviews the impact of financial sanctions on the eligibility of countries or specific index constituents. The Technical Committee meets once a month.

1.1.2. Oversight Committee

The Oversight Committee is comprised of representatives from a broad range of asset managers, consultants and industry bodies. The purpose of this committee is to review the recommendations made by the Technical Committee and also to provide consultation on any market developments which may warrant rule changes.

2. Bond Selection Rules

2.1. Selection criteria for the Markit iBoxx Target Duration TIPS Index

The following selection criteria are applied to select the bonds for the Markit iBoxx Target Duration TIPS index:

- Bond type
- Time to maturity
- Issue amount outstanding
- Selection algorithm and index weights

2.1.1 Bond type

Fixed coupon TIPS are eligible for the index.

In instances where a new bond type is not specifically excluded or included according to the published index rules, Markit will analyse the features of such securities in line with the principles set out in 2.1 of this guide. Markit may consult the specific Index Advisory Committees. Any decision as to the eligibility or ineligibility of a new bond type will be published and the index rules will be updated accordingly.

2.1.2 Time to maturity

For the Markit iBoxx 3-Year Target Duration TIPS Index all bonds must have a minimum remaining time to maturity of at least or equal to one year and less than 10 years as of the rebalancing day.

For the Markit iBoxx 5-Year Target Duration TIPS Index all bonds must have a minimum remaining time to maturity of at least or equal to three years and less than 20 years as of the rebalancing day.

2.1.3 Issue amount outstanding

The real amount outstanding of a bond must be greater than or equal to USD 2bn as of the Bond Selection Date.

2.1.4 First Settlement Date

Only bonds with a first settlement date on or before the rebalancing day are eligible for the index. For bonds settling after the Bond Selection Date (three business days prior to month-end) but before the rebalancing date a price of 100 will be used as index prices while the determining the membership.

2.2. Index re-balancing

The index is rebalanced monthly on the last calendar day of the month.

The membership for the index is determined using information available at the close on the third business day before month end (Bond Selection Date).

The final weights are determined on the rebalancing day based on the composition, beta, notional and $w_{i,t-s}^{ask}$ determined three business days before month-end.

Ten business day before month-end Markit will publish a forward looking composition based on the information available at that time.

2.3. Bond prices

The prices for the index are as of approximately 4 p.m. Eastern Time. For more details please refer to the “Markit iBoxx Pricing Rules” document, available on the Markit iBoxx Rules page of [www.markit.com](http://www.markit.com/en/products/data/indices/bond-indices/iboxx/rules.page) (http://www.markit.com/en/products/data/indices/bond-indices/iboxx/rules.page) in the Methodology Documentation section on the right-hand side of the page.

2.4. Target Duration Blended Price

At each Bond Selection Date the following algorithm is applied to determine the target duration for the index. Each maturity index needs to have a target duration of the specified maturity index +/- 5%, i.e. 3-years +/-5% for the Markit iBoxx 3-Year Target Duration TIPS Index and 5-years +/-5% for the Markit iBoxx 5-Year Target Duration TIPS Index.

2.5. Bond Selection Mechanism and Weight Distribution Lockout

The following mechanism is applied to all eligible bonds to determine the composition of each target duration index.

1. For all eligible bonds determine the distance between the nominal modified adjusted duration of the bond and the target duration of the index.
2. Determine the five bonds with the shortest absolute distance to the target duration of the index.
3. Those five bonds are eligible for the index and will be the “core bonds” of the index.
4. In the first step all eligible bonds are treated to be part of the index, i.e. “index bonds”.
5. Verify for each bond if they are in the lockout period
 - a. If three or more “core bonds” are in the lockout period the lockout rule is not applied at that specific month to the core bonds.
 - b. If a bond i is in the lockout period and the new weight is higher than the maximum eligible weight for that bond as defined in chapter 2.6; the excessive weight is distributed to the “core bonds” that are not in the lockout period.
6. Determine the nominal market-value weighted average modified adjusted duration (“average duration”) of the index.
7. If the “average duration” of all “index bonds” is in between the target duration of the index - i.e. +/-5%+target duration - the index will consist of all “index bonds”. Otherwise an adjustment to the list of “index bonds” is necessary.
8. If the “average duration” is above the target duration; the full weight of the “index bond” with the highest duration is redistributed pro rata to the “core bonds”; otherwise the full weight of the “index bond” with the lowest duration is redistributed pro rata to the “core bonds”.
9. Repeat steps 5 to 8 until either the “average duration” is in the predefined range or only the “core bonds” are left in the list of “index bonds”.
10. Exclude all bonds with a zero weight from the list of “index bonds”

2.6. Lockout

A full and partial lockout period of one month is applied to the bonds. For bonds in lockout, the weight of the bond is not increased. The lockout rule is applied whenever at least one of the following two conditions are valid:

1. Condition 1 is satisfied when both of the following stand:

- a. The weight after the rebalancing on the previous month using the new composition is lower than the weight of the same bond at last month end using the composition as of that day, i.e. $w_{i,t-2s*}^+ < w_{i,t-2s*}^-$ where $t - 2s *$ is the last month's Bond Selection Date.
 - b. And the weight of the bond based on the new composition is higher as the weight of the bond based on the previous month's composition as of the Bond Selection Date, i.e. $w_{i,t-s*}^+ > w_{i,t-s*}^-$, where $t - s *$ is defined as the current Bond Selection Date.
2. Condition 2: weight cap of 25% is reached. If the bond weight based on the new composition exceeds 25%, a weight cap of 25% is applied and the bond is considered to be in lockout.

If both conditions are satisfied at the same time, the maximum eligible weight for the bond is the minimum of $w_{i,t-s*}^-$ and 25%.

2.7. Blended Price

For all new bonds, nominal ask price is used as blended prices. For bonds which have been in the prior month index, the nominal bid price is used.

To derive the blended prices for the bonds the following procedure is used:

First the daily weight of each bond in the current index is determined based on their nominal market value, i.e. the weight of each bond in the current index is:

$$w_{i,t-s*}^- = w_{i,t-2s} \cdot mtdr_{i,t-2s,t-s*} = \frac{BMV_{i,t-2s}^N \cdot mtdr_{i,t-2s,t-s*}}{\sum_{j \in J} BMV_{j,t-2s}^N \cdot mtdr_{j,t-2s,t-s*}}$$

where J is the set of all bonds that are in next months composition and have been in the last months composition.

The following iterative procedure is used to derive the blended prices. The procedure is run twice.

1. Calculate the weight of these bonds after the bond selection based on their nominal base market value as of the Bond Selection Date.
2. Adjust the weight using the bond selection process in the way that the target duration of the index is 3 years +/-5% (5-years +/-5%) as of the Bond Selection Date. This weight is defined as $w_{i,t-s*}^+$ for each bond as of the Bond Selection Date.
3. Determine the weight difference $w_{i,t-s*}^+ - w_{i,t-s*}^-$. The difference shows the weight increase for each bond.
4. The relative weight increase for these bonds is determined as $w_{i,t-s*}^{ask} = \max\left\{0, \frac{w_{i,t-s*}^+ - w_{i,t-s*}^-}{w_{i,t-s*}^+}\right\}$. This is the percentage of the bond that needs to be calculated based on nominal ask prices.
5. The blended price on the Bond Selection Date is calculated as $p_{i,t-s*}^{N,index} = w_{i,t-s*}^{ask} \cdot p_{i,t-s*}^{N,ask} + (1 - w_{i,t-s*}^{ask}) \cdot p_{i,t-s*}^{N,bid}$ where $t - s *$ is defined as the current Bond Selection Date.

Repeat the procedure with the newly calculated price $p_{i,t-s*}^{N,index}$.

On the rebalancing date the blended price is calculated as $p_{i,t-s}^{N,index} = w_{i,t-s*}^{ask} \cdot p_{i,t-s}^{N,ask} + (1 - w_{i,t-s*}^{ask}) \cdot p_{i,t-s}^{N,bid}$ where $t - s *$ is defined as the current Bond Selection Date.

2.8. Number of Bonds

The index contains at least 5 bonds, i.e. the "core bonds" as defined above. If less than 5 bonds are available in the eligible maturity bucket, the maturity bucket will be extended in 2.5 year steps on both ends until 5 bonds are eligible for the index. The minimum time-to-maturity in such a case will be 1 year.

2.9. Index calculation

The indices will be calculated based on the SIFMA US calendar and for the last calendar day of each month. Index calculation is based on nominal bid prices. In the event that no price can be established for a particular bond, the index continues to be calculated based on the last-available price. This might be the case in periods of market stress, or disruption as well as in illiquid or fragmented markets. If the required inputs become impossible to obtain, Markit may consult the specific Index Advisory Committees at the following rebalancing date. To ensure consistency,

decisions taken are made publicly available on a timely basis and Markit has the ability to refer back to previous cases.

3. Index Formulae and Bond Analytics

3.1. Inflation-Adjusted Amount Outstanding & Index-Ratio

The current market capitalization of a bond is affected by the real amount outstanding, the real price of the bond, and any adjustments due to past inflation. The inflation-adjusted amount outstanding (nominal amount outstanding) is equal to the product of the inflation index ratio multiplied by the unadjusted amount outstanding:

$$N_{i,t}^N = N_{i,t} \cdot IR_{i,t}$$

, where the index ratio is defined as:

$$IR_{i,t} = \frac{CPI_t}{CPI_{t_0}}$$

3.2. Clean Price Index

The nominal price index is calculated as follows:

$$PI_t^N = PI_{t-s}^N \frac{\sum_{i \in I} (p_{i,t}^R \cdot IR_{i,t} \cdot N_{i,t-s})}{\sum_{i \in I} (p_{i,t-s}^R \cdot IR_{i,t-s} \cdot N_{i,t-s})}$$

; and the real price index is calculated as follows:

$$PI_t^R = PI_{t-s}^R \frac{\sum_{i \in I} (p_{i,t}^R \cdot N_{i,t-s})}{\sum_{i \in I} (p_{i,t-s}^R \cdot N_{i,t-s})}$$

3.3. Total Return Index

Two different total return indices are provided; an adjusted version taking into account the inflation adjustment (nominal total return), and an unadjusted version (real total return) based on unadjusted real market values.

The nominal total return index is calculated as follows:

$$TR_t^N = TR_{t-s}^N \frac{\sum_{i \in I} \left((p_{i,t}^R \cdot IR_{i,t} + A_{i,t}^R \cdot IR_{i,t} + XD_{i,t} \cdot (CP_{i,t}^R \cdot IR_{i,t} + G_{i,t^*,t}^R \cdot IR_{i,t^*})) \cdot N_{i,t-s} \right)}{\sum_{i \in I} \left((p_{i,t-s}^R + A_{i,t-s}^R + XD_{i,t-s} \cdot CP_{i,t-s}^R) \cdot N_{i,t-s} \cdot IR_{i,t-s} \right)}$$

and the real total return is calculated as follows:

$$TR_t^R = TR_{t-s}^R \frac{\sum_{i \in I} \left((p_{i,t}^R + A_{i,t}^R + XD_{i,t} \cdot (CP_{i,t}^R + G_{i,t^*,t}^R)) \cdot N_{i,t-s} \right)}{\sum_{i \in I} \left((p_{i,t-s}^R + A_{i,t-s}^R + XD_{i,t-s} \cdot CP_{i,t-s}^R) \cdot N_{i,t-s} \right)}$$

3.4. Inflation-Adjusted Duration

The annual modified adjusted duration of each bond is calculated using the following formula: $MD_{i,t}^{a,NM} = MD_{i,t}^{a,R} \cdot \beta_{t-s^*}$. The following methodology is applied to determine the beta for each index at every month end.

To determine the index, the values of each node at each month-end over the last 5 years are determined. The values for nodes 1, 3, 5, 7, 10, 15 and 20 are determined.

1. The zero curves for treasuries using all treasury bonds from Markit iBoxx USD Treasury index
2. The zero curve for all the TIPS using the securities in the Markit iBoxx TIPS Inflation-Linked Index.

For each month a regression model between the two zero curves is applied to each node. The data ranges between the values available as of the Bond Selection Date and the month-end data for the last 5 years prior to the Bond Selection Date.

The beta for each target duration index is calculated using a different set of nodes:

1. For the Markit iBoxx 3-Year Target Duration TIPS Index, nodes 1, 3, 5, 7 and 10 are used.
2. For the Markit iBoxx 5-Year Target Duration TIPS Index, nodes 3, 5, 7, 10, 15 and 20 are used.

3.5. Historical Data

The base date of the index is December 31st 2005 with a value of 100.

3.6. Index publication

The indices are published on <ftp://indexco.com>, Bloomberg, Reuters and www.markit.com. Below is a summary of the IDs for each publication channel:

INDEX_NAME	ISIN	SEDOL	BLOOMBERG	RIC
Markit iBoxx 3-Year Target Duration TIPS Total Return Index	GB00B3VJB812	B3VJB81	IBXXTD3T	.IBOXTD3T
Markit iBoxx 3-Year Target Duration TIPS Price Index	GB00B4JQ7166	B4JQ716	IBXXTD3C	.IBOXTD3C
Markit iBoxx 5-Year Target Duration TIPS Total Return Index	GB00B5T40Y12	B5T40Y1	IBXXTD5C	.IBOXTD5T
Markit iBoxx 5-Year Target Duration TIPS Price Index	GB00B4VXJP34	B4VXJP3	IBXXTD5T	.IBOXTD5C

3.7. Index Restatement

Index restatement follows the policy described in the *Index restatement policy* document, available on the Markit iBoxx Rules page of [www.markit.com](http://www.markit.com/en/products/data/indices/bond-indices/iboxx/rules.page) (<http://www.markit.com/en/products/data/indices/bond-indices/iboxx/rules.page>) in the Methodology Documentation section.

3.8. Index Review

Index methodology reviews for the indices outlined within this guide are performed on a periodic basis. Any material changes to the methodology governing the indices are published on the Markit website.

4. Annotations

$A_{i,t}^R$	Real accrued interest for bond i at date t
β_{t-s^*}	Reference index inflation beta as of the Bond Selection Date $t - s^*$
$BMV_{i,t}^N$	Nominal base market value for bond i at date t
$A_{i,t-s}^R$	Real accrued interest for bond i at rebalancing date $t - s$
$C_{i,t}^R$	Real coupon for bond i at date t
$C_{i,t-s}^R$	Real coupon for bond i at rebalancing date $t - s$
CPI_t	Reference Consumer Price Inflation on settlement date t
CPI_{t_0}	Base index level applying to the interest accrual date of the bond
$G_{i,t^*,t}^R$	Real coupon payment received for bond i at date t^* still retained in the index as cash at date t (i.e. date t^* is in the same settlement month as t , but t^* is earlier than/or at date t)
I	List of bonds that are in the index
$IR_{i,t}$	Index ratio for bond i at date t
$MD_{i,t-s}^{a,R}$	Annual modified real duration for bond i at rebalancing date $t - s$
$MD_{i,t-s}^{a,NM}$	Annual modified adjusted duration for bond i at rebalancing date $t - s$
$mtdr_{i,t-2s,t-s^*}$	month-to-date return for bond i at from prior re-balancing $t - 2s$ to the Bond Selection Date $t - s^*$
$N_{i,t}$	Notional of bond i at date t
$N_{i,t}^N$	Nominal notional of bond i at date t
$p_{i,t}^{N,ask}$	Nominal clean ask price for bond i at date t
$p_{i,t}^{N,bid}$	Nominal clean bid price for bond i at date t
$p_{i,t}^{N,index}$	Nominal clean bid price for bond i at date t
$p_{i,t}^R$	Real clean price for bond i at date t
PI_t^N	Nominal price index date t
PI_t^R	Real price index date t
t	Calculation date for the index
$t - s$	Rebalancing date for the index
$t - s^*$	Bond Selection Date for the index
$t - 2s$	Prior months rebalancing date for the index
TR_t^N	Nominal total return index level at date t
TR_t^R	Real total return index level at date t
$w_{i,t}$	weight of bond i at date t in the index
$XD_{i,t}$	Indication for bond i at whether it entered the index at the last rebalancing date $t - s$ during its ex-dividend period

5. Further Information

- Glossary of key terms is available in the Glossary document, available on the Markit iBoxx Rules page of www.markit.com (<http://www.markit.com/en/products/data/indices/bond-indices/iboxx/rules.page>) in the Methodology Documentation section

- For contractual or content issues please refer to

Markit Indices Limited
Walter-von-Cronberg-Platz 6
60594 Frankfurt am Main
Germany

Tel +49 (0) 69 299 868 100
Fax +49 (0) 69 299 868 149

E-mail iBoxx@markit.com
internet: www.markit.com/indices

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